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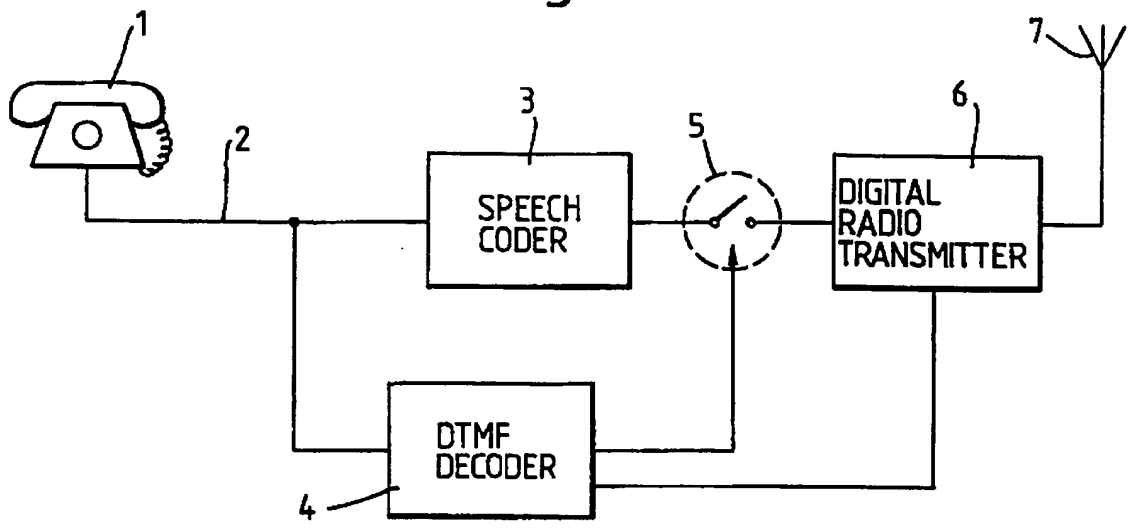
(54) Dialled digit handler

(57) Apparatus is provided for enabling a standard telephone handset to be used in conjunction with a digital mobile radiotelephone system.

DTMF dialled signals are encoded into digital form suitable for transmission over an RF channel and regenerated at the receiving end for routing to their intended destination. Switching means (5) operated by a DTMF decoder (4) interrupts the link between a speech coder (3) and radio transmitter (6) while a dialling signal is present.

Fig.1.



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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

Fig.1.

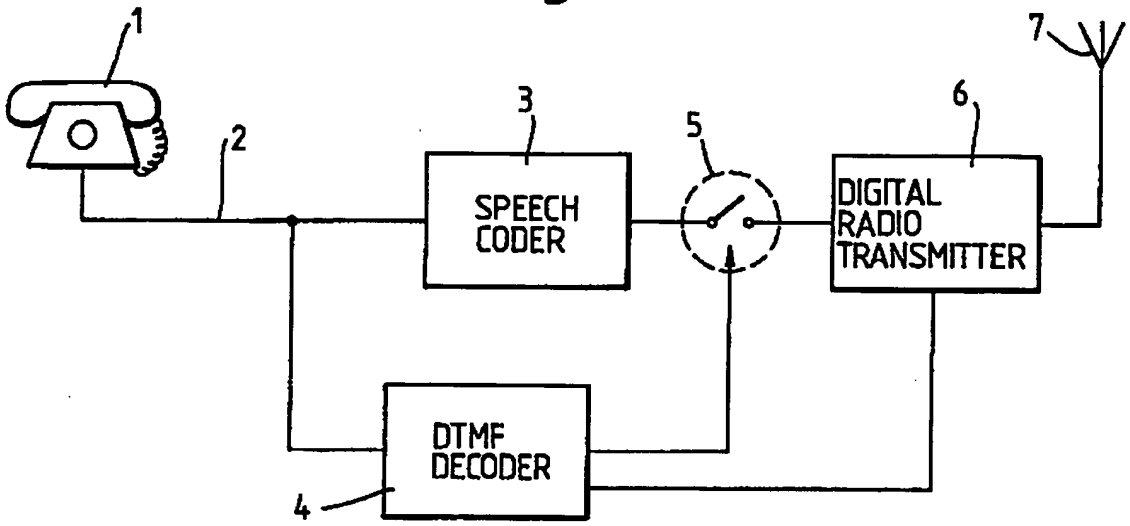
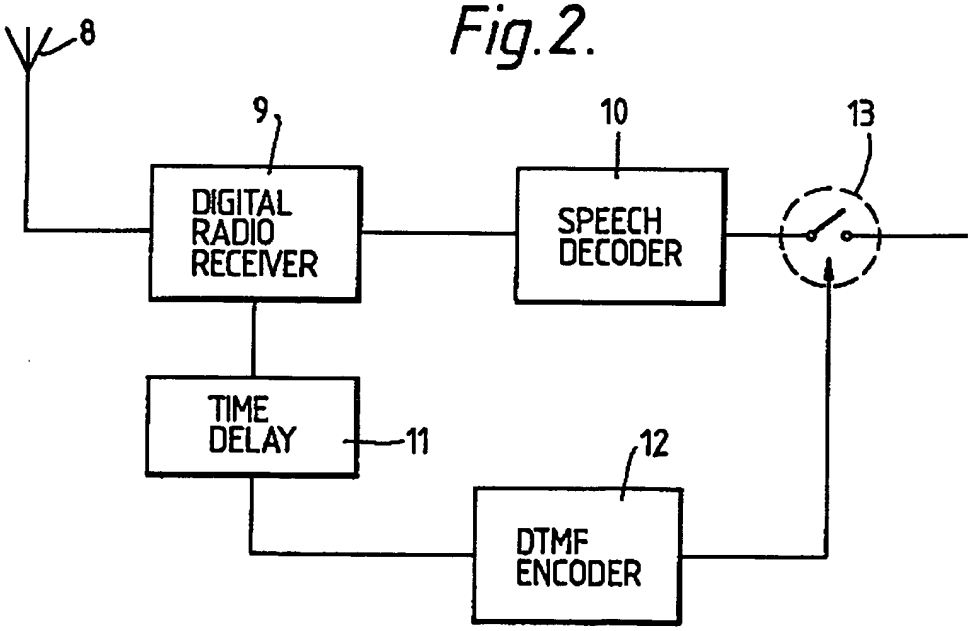

1
2
3
SPEECH CODER
5
6
DIGITAL RADIO TRANSMITTER
7
DTMF DECODER
4

Fig.2.


8
9
DIGITAL RADIO RECEIVER
10
SPEECH DECODER
13
TIME DELAY
11
12
DTMF ENCODER

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DIALLED DIGIT HANDLER

This invention relates to radiotelephone communication systems and in particular to user interfaces for digital telephone systems.

In a conventional mobile telephony system, when digits are dialled using a handset, they are held in the user terminal until the SEND key is pressed. At this point the digits are transmitted to a base station by means of a signalling mechanism. Without a SEND key or a method of signalling a SEND command from the hand set, this mechanism cannot operate.

In contrast, handsets for use with static, non-mobile telephone systems send digits by dual tone multi-frequency (DTMF) signalling or another mechanism (eg loop disconnect), and do not have a SEND key.

In digital mobile telephony, the "in-band" information ie speech, is converted to digital representation for transportation across the air interface. To conserve bandwidth, various techniques are used to minimise the bit rate of the digital modulation whilst preserving the recovered quality of the speech. However these techniques are optimised for the speech signal, not any DTMF signals which may be present in-band. Thus, any DTMF signals present are likely to be sufficiently distorted by the speech coding method as to be unrecognisable by equipment at the receiving end of the telephone connection.

An object of this invention is to adapt a handset intended for use with a static telephone system so that it can operate

satisfactorily when used as part of a mobile radiotelephone system.

In particular, it is an object of the invention to provide a means for transcoding a DTMF signal into a form suitable for transmission over a digital radio communications channel.

The invention provides encoding apparatus having an input for connection to a telephone hand-set and an output for connection to a radio transmitter, said apparatus comprising:

speech coding means for digitally encoding an analogue speech signal;

means for detecting and digitally encoding dialling signals; and

switching means, controlled by the detecting and encoding means, for inhibiting transmission of speech signals while said dialling signals are present at the input.

According to a further aspect of the invention there is provided:

decoding apparatus having an input for connection to a digital radio receiver and an output for connection to a telephone network, said apparatus comprising:

speech decoding means for converting a digitally encoded speech signal into an analogue speech signal;

encoding means for converting a digitally-encoded dialling signal into a DTMF signal; and

switching means controlled by the encoding means for inhibiting transmission of analogue speech signals to the telephone network while a dialling signal is present at the input.

An embodiment of the invention will now be described, by way of example only, with reference to the drawings of which

Fig 1 is a block diagram of an encoding system according to the invention; and

Fig 2 is a block diagram of a decoding system according to the invention and

In Fig 1 a static telephone handset 1 has an output line 2 which is connected, in parallel, to a speech coder 3 and a DTMF decoder 4. A switch 5, controlled by the output of the DTMF decoder 4 is interposed in a connection between the output of the speech coder 3 and one input to a digital radio transmitter 6. The transmitter 6 is provided with a second input which is connected to an output of the DTMF decoder. Signals can be transmitted over a radio link by an aerial 7.

The system of Fig 1 operates in the following manner. When a sequence of numbers is dialled using the handset 1, a corresponding DTMF signal is generated on line 2. This signal is detected by the DTMF decoder 4.

The decoder 4 may be a commercially available device which translates DTMF tones into a binary equivalent.

The decoder 4 reacts to the detected DTMF signal by generating a signal which activates the switch 5. As a result, the output line of the speech coder 3 is interrupted. During this interruption, the sequence of numbers dialled is extracted from the DTMF signal by the decoder 4 and fed to the transmitter 6. The signal from the decoder 4 may take any convenient form of binary message. The digital radio transmitter

6 can transmit over speech and signalling channels and could for example take the form of a 900 MHz Time Division Multiple Access (TDMA) transmitter.

Thus the transmitter 6, via aerial 7, transmits information relating to the dialled number sequence over the air interface. A signalling channel is used for transmitting said information and takes the form appropriate to the mobile telephone system with which it is being used. If the system in use is provided with a dedicated control channel, then this channel could, conveniently, be employed.

The signalling channel is opened by the presence of the first digit from the DTMF decoder 4.

When the transmission of dialled digits is complete, the switch 5 is closed on command of the decoder 4 and the link from speech coder 3 to transmitter 6 is resumed. Thus transmission of speech is possible (over a speech channel) by means of the radio transmitter 6 and aerial 7.

The speech coder 3 may be a commercially available device utilising a linear predictive coding algorithm.

In an alternative embodiment, the switch 5 is located in the link between the handset 1 and the speech coder 3.

In Fig 2, signals arriving over an air interface are received by an aerial 8 and a digital radio receiver 9. The receiver 9 has two outputs, one being connected to a speech decoder 10 and another being connected to a time delay module 11.

The output of the time delay module 11 is connected to a DTMF encoder 12 whose own output controls a switch 13. The switch 13 is located in the output path of the speech decoder 10.

In operation, signals transmitted by the encoding system of Fig 1 are received by the aerial 8 and radio receiver 9. The receiver 9 recovers speech signals from a speech channel and dialled digits from the signalling channel according to known principles.

The speech decoder 10 decodes any speech signal present from a digital to an analogue form and the DTMF encoder 12 regenerates the DTMF tones. Both decoder 10 and encoder 12 are commercially available devices.

The output of the encoder 15 controls the switch 13 located on the output line of the speech decoder 10. In this way the dialled digits are re-inserted into the speech path as DTMF tones. Using this method gives the advantage of allowing DTMF tones to be used for in-message signalling eg to control telephone answering machines, for touch-tone pad access to banking services, etc. However, it is important to compensate for delays in the system (particularly in the speech encoding and decoding processes and the radio air interface framing) to ensure that any residual DTMF tones which may be sent via the speech path are switched out either at the source end (by switch 13 or at the far end (by switch 5). This is achieved by the provision of the time delay module 11 which is present in the connection between the radio receiver 9 and the DTMF encoder 12. The module 11 acts by prolonging the time for which the

DTMF encoder 12 operates by a time T, such that T is greater than the system delays.

The output line of the speech decoder 10 is routed to a telephone exchange which routes the call to its intended destination.

CLAIMS

1. Encoding apparatus having an input for connection to a telephone hand-set and an output for connection to a radio transmitter, said apparatus comprising:

speech coding means for digitally encoding an analogue speech signal;

means for detecting and digitally encoding dialling signals; and

switching means, controlled by detecting and encoding means for inhibiting transmission of speech signals while said dialling signals are present at the input.

2. Decoding apparatus having an input for connection to a digital radio receiver and an output for connection to a telephone network, said apparatus comprising;

speech decoding means for converting a digitally encoded speech signal into an analogue speech signal;

encoding means for converting a digitally-encoded dialling signal into a DTMF signal; and

switching means controlled by the encoding means for inhibiting transmission of analogue speech signals to the telephone network while a dialling signal is present at the input.

3. Encoding apparatus for use with a radiotelephone communications network substantially as hereinbefore described with reference to Fig 1 of the drawings.

4. Decoding apparatus for use with a radiotelephone communications network substantially as hereinbefore described with reference to Fig 2 of the drawings.

Patents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search Report)

Application number: 9127074.4

Relevant Technical fields

(i) UK Cl (Edition K) H4K - (KYX,KYR)

(ii) Int Cl (Edition 5) H04Q

Search Examiner

MR S J L REES

Databases (see over)

(i) UK Patent Office

(ii)

Date of Search

9 MARCH 1992

Documents considered relevant following a search in respect of claims: ALL CLAIMS

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
	NONE	

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Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

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E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

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